A PRELIMINARY CHECKLIST OF THE MARINE ALGAE OF CAMPOBELLO ISLAND, NEW BRUNSWICK, CANADA[1]

RICHARD A. STONE, EDWARD J. HEHRE, JOAN M. CONWAY AND ARTHUR C. MATHIESON

Although several investigators have reported on the benthonic marine algae of the Bay of Fundy-Passamaquoddy Region of New Brunswick, Canada, none except Edelstein, Chen and McLachlan (1970) have made detailed seasonal investigations and few have interpreted the observed distributional patterns. The present paper summarizes three years of observations and collections on the benthonic marine algae of Campobello Island, New Brunswick, which is in the southern portion of the Bay of Fundy.

The earliest record of marine algae from Campobello Island is given by Eaton (1873). He lists 11 species from Campobello in his account of the algae "in the vicinity of Eastport, Maine". Many other species mentioned are implied as being present. Farlow (1881) recorded only one species *(Rhodophyllis dichotoma)* from the Island. The collections of Hay (1887), Hay and MacKay (1886, 1888) and Fowler (1901, 1902) are from the environs of the Island, but they make no specific mention of Campobello Island. Klugh (1917) listed 24 species from selected sites on Campobello; again, many other species are implied as being present. Klugh was one of the first to record a variety of environments in the region and to discuss floristic differences in the Passamaquoddy-Bay of Fundy area. Bell and MacFarlane (1933), MacFarlane and Milligan (1965), Colinveaux (1966) and Edelstein, Chen and McLachlan (1970) have discussed the distribution of marine algae in the Bay of Fundy and adjacent waters. The latter workers summarized a year round study of the vegetation at Digby

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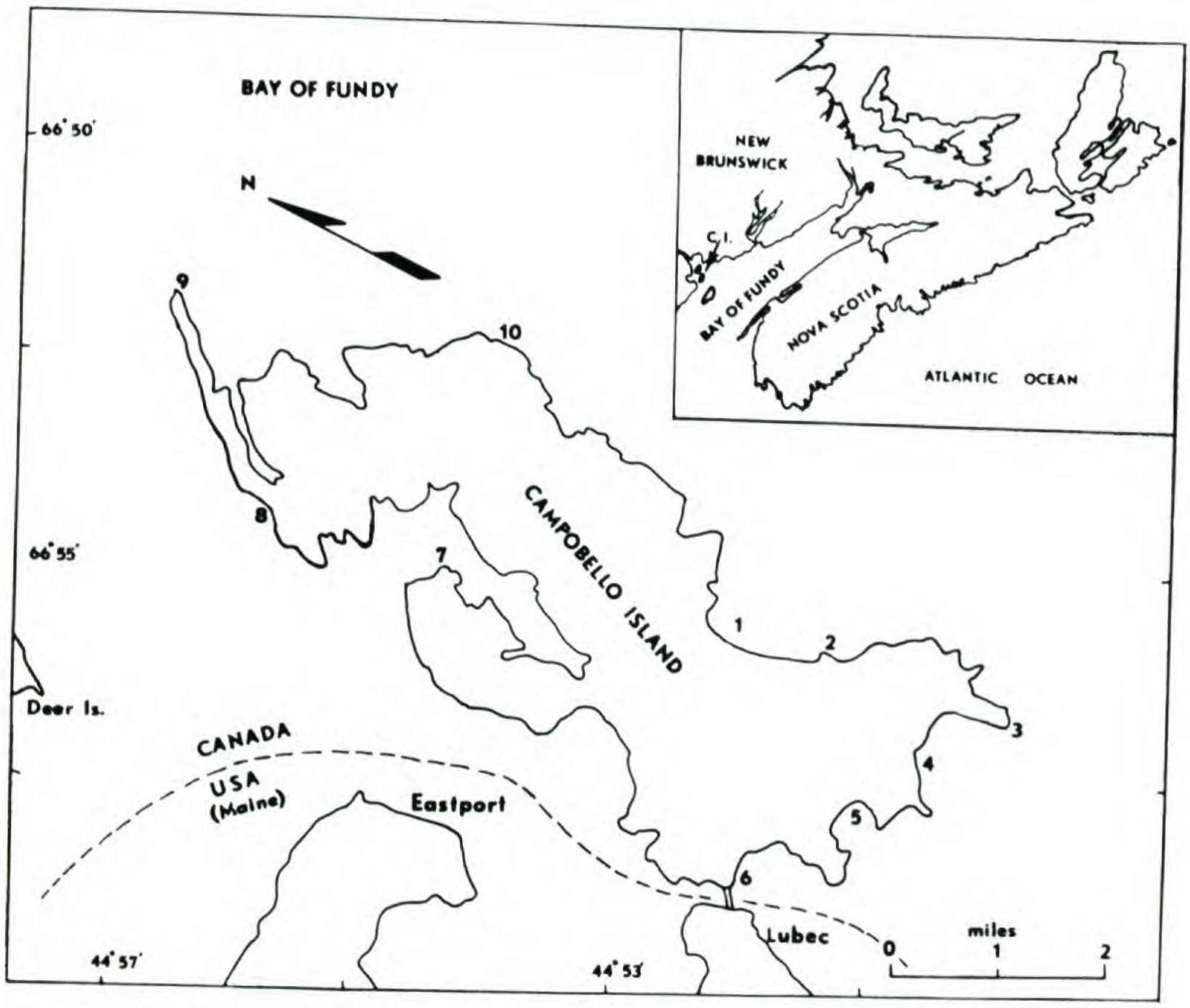

Map of Campobello Island showing locations of collections.

Neck, Bay of Fundy, Nova Scotia, including observations on seasonal changes, vertical distribution and reproductive structures present. Cardinal (1967a, b, c) recorded several new species from New Brunswick and Quebec, and he (Cardinal, 1968) has also given an excellent summarization of the distribution of the marine algae on the east coast of Canada.

Collections and observations of marine algae were made at ten locations (Fig. 1) on Campobello Island, New Brunswick, Canada from May 1966 to May 1969. Table I summarizes the dates and sites of collections. The methods of collection and identification of specimens were similar to those of Mathieson, Hehre and Reynolds (in press) except that most collections were restricted to the littoral zone. The nomenclature of the Second Revised British Checklist

(Parke and Dixon, 1968) has been applied for most taxa, except the Acrochaetiaceae (Papenfuss, 1947). Herbarium voucher specimens of all collections (approximately 1,000) have been deposited in the Algal Herbarium of the University of New Hampshire (NHA). Additional specimens are in the personal herbaria of the authors. The vertical distribution of algae at Campobello Island is described according to the biological classification of Lewis (1964).

Campobello Island is located approximately 1/3 mile offshore from the coastal town of Lubec, Maine, near the boundary of Passamaquoddy Bay and the Bay of Fundy (Fig. 1). The maximum length and width of the Island are approximately 9 by 3 1/2 miles respectively. Much of the Island is covered with marshes and hills. The coast varies from steep granite cliffs to barrier beaches against marshy lowlands. The eastern shore is exposed to the greatest wave action. No major freshwater rivers are evident, and the surface water salinities around the Island are probably uniform. Differences in vegetation are primarily due to physical factors such as wave action, tidal amplitude (average 15-20 feet) and substrate. A brief description of each station is summarized below.

STATIONS

HERRING COVE HEAD (Fig. 1, station 1): An exposed location at the north end of Herring Cove. The substrate consists of steep rock outcrops, which are impenetrable in some places. Many tide pools are present at all levels, and they provide a wide variety of habitats which are not found at any other station except Whiterock Cliffs. Collections were made at Herring Cove Head on most visits to the Island, and these provided a comparison for all other stations.

RACCOON POINT (Fig. 1, station 2): An exposed location at the south end of Herring Cove. It is also designated as Con Robinson's Point or Dinner Head on some maps. The substrate is similar to that at Herring Cove Head, except that the rock outcrops are lower.

LIBERTY POINT (Fig. 1, station 3): An exposed location

on the southern tip of the Island. The substrate is primarily composed of cobbles and small boulders. Few tide pools are present.

GREATER AND LESSER DUCK PONDS (Fig. 1, station 4 and 5): Both locations are sheltered barrier beaches. The substrate is primarily muddy or mud-sand, but cobble and occasional boulders occur near low water. Freshwater stream beds empty into both of the bays. However, the freshwater outfall is limited and it only influences the vegetation in high, marshy areas.

MULHOLLAND'S BEND (Fig. 1, station 6): A muddy area with occasional scattered boulders. It is located under the bridge at the southwest part of the Island. Although the area is protected from wave action it is subject to strong tidal currents. As is typical of other tidal current areas many species of seaweeds are very large in size.

HARBOUR DE LOUTRE (Fig. 1, station 7): A cul-de-sac which is the most sheltered of our stations. The substrate is primarily mud, but occasional cobbles, fish weirs, and one large rock outcrop (Crabble Rock) provide a variety of habitats for seaweeds. Here, as at station 6, many species of seaweeds are very large in size.

WILSON'S BEACH (Fig. 1, station 8): A sheltered shore near the town docks at Wilson's Beach — the only sizeable town on the Island. Collections were made from pier pilings, small scattered rocks and rock outcrops.

EAST QUODDY HEAD (Fig. 1, station 9): A semi-exposed location at the easternmost tip of the Island. The substrate consists of steep rock outcrops.

WHITEROCK CLIFFS (Fig. 1, station 10): An exposed location on the northeast side of the Island. The substrate consists of very steep rock outcrops, many of which are difficult to climb.

A total of 114 taxa of seaweeds were collected at the ten stations, including 32 Chlorophyta, 39 Phaeophyta, 42 Rhodophyta and 1 Xanthophyta. The distribution and seasonal occurrence of each taxa is summarized in Tables II-IV.

The following checklist includes brief comments of noteworthy features.

XANTHOPHYTA

Vaucheria sp.: Found on high, muddy substrates at Great Duck Pond; vegetative.

CHLOROPHYTA

Capsosiphon fulvescens (C. Agardh) Setchell *et* Gardner: On pebbles at Harbour de Loutre.

*__Chaetomorpha aerea__ (Dillwyn) Kützing: Found once (May) at Harbour de Loutre.

Chaetomorpha melagonium (Weber *et* Mohr) Kützing: Common on rocks in the low eulittoral (in tide pools) and sublittoral zones of exposed locations.

Cladophora flexuosa (O. F. Müller) Harvey (= *Cladophora sericeae* (Hudson) Kutzing *sensu* C. van den Hoek, 1963) : Found once on a mud flat at Great Duck Pond.

*__Codiolum gregarium__ A. Braun: Found once (May) on rocks in the high littoral zone; mixed with *C. pusillum*. *Codiolum gregarium* may represent the "sporophyte" generation of one or more local species of *Urospora* (Scagel, 1966).

Codiolum petrocelidis Kuckuck: Endophytic within *Petrocelis middendorfii*. It may be the "sporophyte" generation of *Spongomorpha spinescens* or other local members of the Cladophorales (Scagel, 1966).

Codiolum pusillum (Lyngbye) Kjellman in Foslie: Locally abundant during the winter and spring; mixed with *C. gregarium* in the upper littoral zone. It may also represent the "sporophyte" generation of one or more local species of *Urospora* (see Scagel, 1966).

Enteromorpha erecta (Lyngbye) J. Agardh: Common; free-floating or attached to small stones in the eulittoral zone.

Enteromorpha groenlandica (J. Agardh) Setchell *et* Gardner: Occasional on rocks in the mid eulittoral zone.

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*Within known distributional range, but not previously recorded from New Brunswick.

Enteromorpha intestinalis (L.) Link: Abundant on rocks throughout the eulittoral zone.

Enteromorpha linza (L.) J. Agardh: Common on rocks in the lower eulittoral zone.

Enteromorpha micrococca Kützing: Found once (August) on rocks in the high eulittoral zone.

Enteromorpha minima Nägeli (= *Blidingia minima* (Nägeli *ex* Kützing) Kylin): Occasional on rocks in the high littoral zone.

***Epicladia flustrae** Reinke: Endophytic within Sertularians.

Monostroma fuscum (Postels *et* Ruprecht) Wittrock: Locally abundant on rocks and as an epiphyte in the lower eulittoral and sublittoral zones.

Monostroma grevillei (Thuret) Wittrock: Common from late winter to early summer in the mid and lower eulittoral zones.

***Monostroma leptodermum** Kjellman: A conspicuous epiphyte on *Zostera marina* during the summer.

Monostroma pulchrum Farlow: Locally abundant on rocks and as an epiphyte in the low eulittoral and sublittoral zones.

Percursaria percursa (C. Agardh) Rosenvinge: Occasional on muddy, marshy substrates in the high littoral zone.

Prasiola stipitata Suhr in Jessen: Occasional on high rocks (splash zone) in exposed and semi-exposed locations.

***Pseudendoclonium marinum** (Reinke) Aleem *et* Schulz: Common on rocks in the mid and lower eulittoral zones.

***Rhizoclonium riparium** (Roth) Harvey var. **implexum** (Dillwyn) Rosenvinge: Locally abundant on muddy, marshy substrates in the high littoral zone. Usually entangled among other green algae.

Rhizoclonium tortuosum Kützing: Common among various plants in the lower eulittoral zone.

Spongomorpha arcta (Dillwyn) Kützing: Abundant on rocks in the lower eulittoral zone at all stations.

*__Spongomorpha hystrix__ Strömfelt: Found once (May) on rocks in the lower eulittoral zone.
__Spongomorpha spinescens__ Kützing: Locally abundant on rocks in the lower eulittoral (often in tide pool) and sublittoral zones; rarely as an epiphyte.
__Ulothrix flacca__ (Dillwyn) Thuret in LeJolis: Occasional; growing on rocks, muddy surfaces and epiphytic on various algae in the mid and high eulittoral zones.
__Ulva lactuca__ Linnaeus: Common as free-floating masses in muddy areas, or epiphytic on coarse algae in the eulittoral zone. Only occasionally found attached to rocks or pebbles.
__Urospora collabens__ (C. Agardh) Holmes *et* Batters: Occasional on rocks in the upper littoral zone. As suggested by Mathieson, Hehre and Reynolds (in press) *U. collabens* may represent a larger growth form of *U. penicilliformis*.
*__Urospora penicilliformis__ (Roth) Areschoug: Occasional on rocks in the upper littoral zone.
*__Urospora speciosa__ (Carmichael ex Harvey) Leblond *et* Hamel: Our material fits the description given by Edelstein and McLachlan (1966). It occurs commonly on rocks in the mid and upper eulittoral zones, and occasionally epiphytic on coarse algae. Previously recorded from New Hampshire by Mathieson, Hehre and Reynolds (in press).
__Urospora wormskjoldii__ (Mertens) Rosenvinge: Uncommon; on rocks in the lower eulittoral zone.

PHAEOPHYTA

__Agarum cribrosum__ (Mertens) Bory: Common on rocks in the lower eulittoral (tide pools) and sublittoral zones.
__Alaria esculenta__ (L.) Greville (including *Alaria musaefolia* (De la Pylaie) J. Agardh *sensu* Widdowson, 1964): Abundant in exposed locations in the low eulittoral and sublittoral zones. During the winter the specimens are often reduced to residual portions of the stipe.
__Ascophyllum nodosum__ (L.) LeJolis: Ubiquitous throughout the eulittoral zone at all stations.

Chorda filum (L.) Stackhouse: Occasional on small rocks in the lower eulittoral and sublittoral zones; also collected in drift.

Chorda tomentosa Lyngbye: Common on small rocks in the lower eulittoral and sublittoral zones; also collected as free-floating specimens. Several had a larger diameter (over 4 mm) than plants recorded by Taylor (1957).

Chordaria flagelliformis (O. F. Müller) C. Agardh (including var. *densa* Farlow) : Common on rocks, as an epiphyte, and free-floating in the lower eulittoral zone. Frequently associated with *Dictyosiphon foeniculaceus* — particularly at muddy locations.

Cladosiphon zosterae (J. Agardh) Kylin: Found once (August) growing on rocks in the lower eulittoral zone.

Desmarestia aculeata (L.) Lamouroux: Common on rocks in the lower eulittoral (in tide pools) and sublittoral zones.

Desmarestia viridis (O. F. Müller) Lamouroux: Locally abundant on rocks in low tide pools and in the sublittoral zone.

Dictyosiphon foeniculaceus (Hudson) Greville: Common in the lower eulittoral zone; often associated with *Chordaria flagelliformis* as well as epiphytic on the latter plant.

*__Dictyosiphon macounii__ Farlow: Found once (August) at Little Duck Pond.

Ectocarpus confervoides (Roth) Le Jolis: An occasional epiphyte on various coarse algae.

Ectocarpus fasciculatus Harvey: Uncommon; on rocks in the lower eulittoral zone.

Ectocarpus siliculosus (Dillwyn) Lyngbye: Found once (August) as an epiphyte on *Laminaria*.

Elachista fucicola (Velley) Areschoug (including *Elachista lubrica* Ruprecht *sensu* Jassund, 1959) : A common epiphyte on *Fucus* spp. and *Ascophyllum nodosum*; occasionally found on *Halosaccion ramentaceum*.

Fucus distichus L. subsp. **distichus** Powell: Abundant in high tide pools on exposed rocky shores.

Fucus distichus L. subsp. **edentatus** (De la Pylaie) Powell: Locally abundant on rocks in the lower eulittoral zone.

Fucus distichus L. subsp. **evanescens** (C. Agardh) Powell: Distribution is similar to that of subsp. *edentatus*. However, it is more common in muddy habitats than the latter subspecies.

*__Fucus spiralis__ L.: Locally abundant on rocks in the upper littoral zone.

Fucus vesiculosus Linnaeus: Abundant on rocks in the mid and lower eulittoral zones.

*__Fucus vesiculosus__ L. var. **spiralis** Farlow: Common in the mid and upper eulittoral zones of muddy areas.

*__Isthmoplea sphaerophora__ (Carmichael *ex* Harvey in Hooker) Kjellman: Collected once (August) as an epiphyte on Sertularians at Raccoon Point.

Laminaria digitata (Hudson) Lamouroux: Common in the lower eulittoral and sublittoral zones of exposed locations.

Laminaria longicruris De la Pylaie: Occasional in drift.

Laminaria saccharina (L.) Lamouroux *sensu* Wilce, 1965: All of our specimens are the -- ecotype of Wilce (1965) or *Laminaria agardhii* in Taylor (1957). The plants are abundant in the lower eulittoral (in tide pools) and the sublittoral zones.

Leathesia difformis (L.) Areschoug: Found once (August) as an epiphyte on *Chondrus crispus*.

*__Myrionema strangulans__ Greville: An occasional epiphyte on *Ulva lactuca* and *Laminaria saccharina*.

Petalonia fascia (O. F. Müller) Kuntze: Common (especially during spring and summer) throughout the eulittoral zone.

*__Punctaria latifolia__ Greville: Found twice (June and August) as an epiphyte on *Zostera marina*. Mixed with *Monostroma leptodermum*.

Pilayella littoralis (L.) Kjellman: Common on rocks and epiphytic on various algae in the mid and lower eulittoral zones.

*__Ralfsia borneti__ Kuckuck: Occasional on small pebbles in the lower eulittoral zone.

__Ralfsia clavata__ (Harvey in Hooker) Crouan frat.: Found twice (February and June) on small rocks in the lower eulittoral zone.

__Ralfsia fungiformis__ (Gunner) Setchell *et* Gardner: Locally abundant in mid and lower eulittoral tide pools of exposed stations. Plurilocular sporangia were found in February, 1969. Plurilocular sporangia have only been reported once before in North America (Edelstein, Chen and McLachlan, 1968).

*__Ralfsia pusilla__ (Strømfelt) Batters: Found once (October) as an epiphyte on *Chaetomorpha melagonium*. Unilocular sporangia were evident.

__Ralfsia verrucosa__ (Areschoug) J. Agardh: Found once (May) in a mid eulittoral tide pool.

__Sacchoriza dermatodea__ (De la Pylaie) J. Agardh: Locally abundant in low tide pools and in the sublittoral zone during late spring and summer.

__Scytosiphon lomentaria__ (Lyngbye) Link: Common throughout the eulittoral zone at all stations. Several specimens from Mulholland's Bend were larger (i.e. up to 200 cm long) than those recorded by Taylor (1957).

__Sphacelaria cirrosa__ (Roth) C. Agardh: Locally abundant on vertical rock faces which are covered with overhanging fucoids.

*__Spongonema tomentosum__ (Hudson) Kützing: Found once (August) as an epiphyte on the stipes of *Laminaria*.

RHODOPHYTA

__Ahnfeltia plicata__ (Hudson) Fries: Occasional in sandy areas in the lower eulittoral and sublittoral zones.

*__Antithamnion cruciatum__ (C. Agardh) Nägeli: Found once (May) in a low eulittoral tide pool.

*__Antithamnion floccosum__ (O. F. Müller) Kleen: Occasional in tidepools in the lower eulittoral zone.

*__Audouinella membranacea__ (Magnus) Papenfuss: An occasional endophyte in the lorica of Sertularians.

Bangia fuscopurpurea (Dillwyn) Lyngbye: Common on rocks in the upper littoral zone at exposed locations.

***Ceramium deslongchampsii** Chauvin in Duby var. **hooperi** (Harvey) Taylor: Common throughout the year on vertical rock faces under overhanging fucoids.

***Ceramium rubriforme** Kylin, prox.: Found once (August) in the lower eulittoral zone at Little Duck Pond.

Ceramium rubrum (Hudson) C. Agardh: Found three times (May, June and August) in drift.

Chondrus crispus Stackhouse: Locally abundant in the lower eulittoral and sublittoral zones of rocky stations.

Choreocolax polysiphoniae Reinsch: Common as a parasite on *Polysiphonia lanosa*.

***Clathromorphum circumscriptum** (Strømfelt) Foslie: Common in tide pools in the mid and lower eulittoral zones; also abundant in the sublittoral zone.

Corallina officinalis Linnaeus: Common in the lower eulittoral (in tide pools) and sublittoral zones.

Cystoclonium purpureum (Hudson) Batters var. **cirrhosum** Harvey: Common in tide pools and vertical rock faces in the lower eulittoral zone.

***Dermatolithon pustulatum** (Lamouroux) Foslie: Found once (February) as an epiphyte on *Chondrus crispus*.

Dumontia incrassata (O. F. Müller) Lamouroux: Occasional on rocks in the mid eulittoral zone.

Euthora cristata (C. Agardh) J. Agardh: Found once (February) in drift at Raccoon Point.

Gigartina stellata (Stackhouse) Batters: Common on rocks in the lower eulittoral zone.

Halosaccion ramentaceum (L.) J. Agardh: Common to locally abundant in the mid and lower eulittoral zones. Occasionally abundant in high tide pools. As described by Edelstein and McLachlan (1966) its morphology is extremely variable.

Hildenbrandia prototypus Nardo: Common on rocks throughout the eulittoral zone.

***Kylinia secundata** (Lyngbye) Papenfuss: Occasional as

an epiphyte on *Spongomorpha* spinescens and epizoic on Sertularians.

****Lithophyllum corallinae** (Crouan frat.) Heydrich: Uncommon as an epiphyte on *Corallina officinalis*. Previously recorded from Rhode Island to Maine (Taylor, 1957).

Lithothamnium glaciale Kjellman: Locally abundant in the lower eulittoral (in tide pool) and sublittoral zones.

Membranoptera alata (Hudson) Stackhouse: Found occasionally as an epiphyte on *Ptilota serrata*.

Petrocelis middendorfii (Ruprecht) Kjellman: Common on rocks in the lower eulittoral and sublittoral zones.

Peyssonelia rosenvingii Schmitz: Found once (October) growing on *Clathromorphum circumscriptum* in the lower littoral zone.

Phycodrys rubens (L.) Batters: Common in drift; occasional in tide pools in the lower eulittoral zone, and found once at -30 feet.

Plumaria elegans (Bonnemaison) Schmitz: Occasional in the lower eulittoral zone at most rock stations; often on vertical rock faces under overhanging fucoids.

Polyides rotundus (Hudson) Greville: Found occasionally in low tide pools.

****Polysiphonia arctica** J. Agardh: Found once (June) at Whiterock Cliffs. Previously recorded from the arctic to Nova Scotia (as summarized in Taylor, 1957 and Edelstein, McLachlan and Craigie, 1967).

Polysiphonia flexicaulis (Harvey) Collins: Found twice May and August) as drift at Harbour de Loutre.

Polysiphonia lanosa (L.) Tandy: Ubiquitous; hemiparasite on *Ascophyllum nodosum* throughout the mid and lower eulittoral zones.

Polysiphonia urceolata (Lightfoot *ex* Dillwyn) Greville (Including var. *roseola* (C. Agardh) J. Agardh): Common on rocks in the lower eulittoral and sublittoral zones.

***Porphyra leucosticta** Thuret. Found occasionally during the spring and summer in the lower eulittoral and sublittoral zones.

**Range extension and a new record for New Brunswick.

Porphyra miniata (C. Agardh) C. Agardh: Common at most stations in the lower eulittoral and sublittoral zones during the spring and summer. Frequently free-floating and very large in size (over 10 feet in length at Harbour de Loutre).

Porphyra umbilicalis (L.) J. Agardh: Abundant on rocks in the mid and upper eulittoral zones.

*__Porphyra umbilicalis__ (L.) J. Agardh forma __epiphytica__ Collins: Common as an epiphyte on various coarse algae in the mid and lower eulittoral zones.

Ptilota serrate Kützing: Common in drift; occasionally found attached in low tide pools.

Rhodochorton purpureum (Lightfoot) Rosenvinge: Common on vertical rock faces under overhanging fucoids; found once epiphytic on Sertularians.

Rhodomela confervoides (Hudson) Silva: Common in tide pools in the mid and lower eulittoral zones.

Rhodophysema georgii Batters: Found once (August) epiphytic on *Zostera marina*.

Rhodymenia palmata (L.) Greville: Common in the lower eulittoral zone at all stations.

Spermothamnium repens (Dillwyn) Rosenvinge: Found once (June) epiphytic on *Polyides rotundus*.

Of the 114 species of marine algae found on Campobello Island, ten Chlorophyta, nine Phaeophyta and twelve Rhodophyta are new records for New Brunswick. Two of the red algae also represent extensions of known distributional ranges: *Lithophyllum corallinae* was previously recorded from Rhode Island to Maine (as summarized in Taylor, 1957), while *Polysiphonia arctica* was previously known from the arctic to Nova Scotia (as summarized in Taylor, 1957 and Edelstein, McLachlan and Craigie, 1967). Eaton (1873) recorded *Rhodophyllis dichotoma* (designated as *Calliblepharis ciliata*) from Campobello Island, but we have not found it during our study. At present a total of 115 taxa of marine algae are recorded from Campobello Island.

Several additional species (*Eudesme virescens*, *Porphyra umiblicalis* and *Ceramium elegans*) have been reported by

Bell and McFarlane (1933) from the nearby locations of Lubec Harbor and Eastport, Maine. In addition, several other common species (e.g. *Phyllophora brodiaei, P. membranifolia, Rhodophysema elegans, Polysiphonia nigrescens, Chaetomorpha linum* and *Punctaria plantaginea*) which are reported from Nova Scotia by Edelstein and McLachlan (1966, 1967a, b) are conspicuously lacking from Campobello. Additional sublittoral observations may reveal some of these species. To date few sublittoral collections have been made, but preliminary observations have revealed a depauperate zone from 0 to 35 feet. Sea urchins *(Strongylocentrotus drobachiensis)* were very conspicuous in the investigated sublittoral zones and the vegetation was restricted to scattered specimens of *Desmarestia* spp., *Agarum cribrosum*, a residual covering of crustose corallines, and a few small algae in cracks and crevices.

An interesting aspect of the study has been the comparative composition of the flora at the various stations. A few preliminary comments can be summarized as follows:

(1) The exposed, rocky shores support the greatest biomass and diversity of species.

(2) Substrate is probably the most important single factor determining the floristic composition at different locations, although exposure to wave action is also an important and highly interrelated factor.

(3) As described by Colinvaux (1966), there is a conspicuous uplifting or emergence of sublittoral organisms on Campobello Island as compared to areas in central-southern New England. For example, *Halosaccion ramentaceum, Alaria esculenta* and *Laminaria* spp. are common in the mid intertidal zone (according to the physical delineation of tide levels) at Herring Cove, while they are restricted to the subtidal zone on shores of similar exposure and substrate in New Hampshire (Mathieson, Hehre and Reynolds, in press).

(4) The relatively small number of species found on Campobello Island, as compared to the open Atlantic shores of

Table I. Dates and locations of collections

Stations	20 May 1966	21 May 1966	23 Oct. 1966	4 Feb. 1967	5 Feb. 1967	24 Mar. 1967	14 June 1967	15 June 1967	16 June 1967	17 June 1967	18 May 1968	19 May 1968	5 June 1968	9 Aug. 1968	10 Aug. 1968	11 Aug. 1968	12 Aug. 1968	23 Feb. 1969	17 May 1969	18 May 1969
1. Herring Cove	×	×	×	×				×			×					×		×	×	
2. Raccoon Point				×					×						×				×	
3. Liberty Point									×											
4. Great Duck Pond													×				×			
5. Little Duck Pond													×				×			
6. Mulholland's Bend							×							×						
7. Harbour de Loutre					×	×					×					×			×	
8. Wilson's Beach					×															×
9. East Quoddy Head	×					×									×					×
10. Whiterock Cliffs										×		×								

Nova Scotia, may be due to its relatively sheltered location at the mouth of the Bay of Fundy.

The algal flora of Campobello Island is primarily composed of subarctic and boreal species, but a substantial component of cosmopolitan species is also evident. A comparison of the marine algae from Newfoundland (Mathieson, Dawes and Humm, 1969), Campobello Island and Jaffrey Point, New Hampshire (Mathieson, Hehre and Reynolds, in press) indicates a high degree of similarity between the three areas. Even so there is a higher subarctic component in Newfoundland than at Campobello Island; in turn the boreal and subarctic components are higher at Campobello Island than at Jaffrey Point, New Hampshire. Thus the marine flora of Campobello Island reflects its geographical location.

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DEPT. OF BIOLOGY
UNIVERSITY OF MASSACHUSETTS
BOSTON, MASSACHUSETTS 02116

DEPT. OF BIOLOGY
SOUTHAMPTON COLLEGE OF LONG ISLAND UNIVERSITY
SOUTHAMPTON, NEW YORK

DEPT. OF BOTANY
UNIVERSITY OF MASSACHUSETTS
AMHERST, MASSACHUSETTS 01003

DEPT. OF BOTANY
UNIVERSITY OF NEW HAMPSHIRE
DURHAM, NEW HAMPSHIRE 03824

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Table II. Distribution and Seasonal Occurrence of Chlorophyceae.
The numbers in the columns refer to the stations in Table I.

	J	F	M	A	M	J	J	A	S	O	N	D
Capsosiphon fulvescens			7		7	7						
Chaetomorpha aerea					7							
Chaetomorpha melagonium		2			1, 9, 10	2, 9, 10		1				
Cladophora flexuosa						4						
Codiolum gregarium					1							
Codiolum petrocelidis					1, 2	10		1				
Codiolum pusillum		1			1							
Enteromorpha erecta		2			1, 7, 9	5		2, 5, 6, 7, 9				
Enteromorpha groenlandica					1	4		4				
Enteromorpha intestinalis	1				1, 9, 10	2, 4-7		2, 9, 4-7				
Enteromorpha linza	8				1, 7, 9	2, 3, 5, 6		1, 2, 4, 6, 7, 9				
Enteromorpha micrococca								5				
Enteromorpha minima						1, 10						
Epicladia flustrae					1, 9							
Monostroma fuscum			7		1			1, 4, 5, 6, 9		1		
Monostroma grevillei	8				1, 7, 10	2, 3, 5, 10						
Monostroma leptodermum						5		5, 6				

Table II (cont.)	J	F	M	A	M	J	J	A	S	O	N	D
Monostroma pulchrum					1, 9	1-3, 9, 10						
Percursaria percursa						5		4, 5				
Prasiola stipitata		2, 8			1			2				
Pseudendoclonium marinum		2, 8			1, 7	1, 3		1, 2, 9		1		
Rhizoclonium riparium var. *implexum*						4, 5		4, 5				
Rhizoclonium tortuosum			7		9	4, 5		1, 2, 6, 7, 9		1		
Spongomorpha arcta	1, 2, 8	7			7, 9, 10	1-3, 5-7, 9, 10		1, 2, 4-7, 9, 10				
Spongomorpha hystrix					7							
Spongomorpha spinescens					1, 9	2, 4, 10		1, 2, 4,6		1		
Ulothrix flacca			7		1, 7, 9	9, 10						
Ulva lactuca	1, 2				7, 9	2, 3,						
Urospora collabens	8	4			10 1	5, 6 9		4, 5				
Urospora penicilliformis	8				1, 7	10		4, 9				
Urospora speciosa					1, 7	1, 2, 3, 5, 9, 10		4, 9				
Urospora wormskjoldii					1, 2, 10							

Table III. Distribution and Seasonal Occurrence of Rhodophyceae

	J	F	M	A	M	J	J	A	S	O	N	D
Ahnfeltia plicata					1	3						
Antithamnion cruciatum					10							
Antithamnion floccosum		2			10			1, 9				
Audouinella membranacea					9	1, 3, 9, 10						
Bangia fuscopurpurea					1, 9, 10	1, 9, 10						
Ceramium deslongchampsii var. *hooperi*		2, 8			9, 10	3, 9, 10		2				
Ceramium rubriforme								5				
Ceramium rubrum					7	4		9				
Chondrus crispus		1, 2, 7, 8			1, 9, 10	7, 9		1, 2, 6				
Choreocolax polysiphoniae					1	1, 3, 9, 10		1				
Clathromorphum circumscriptum	1, 2	9	1							1		
Corallina officinalis	1				1, 10	1, 2		1, 2, 3, 9, 10		1, 2		
Cystoclonium purpureum var. *cirrhosum*		2			9, 10	1, 2, 3, 9, 10		2, 9				
Dermatolithon pustulatum		1										
Dumontia incrassata			7		1	1, 6, 7						

Table III (cont.)	J	F	M	A	M	J	J	A	S	O	N	D
Euthora cristata		2										
Gigartina stellata		1, 2, 8	7		1	1, 2, 3, 6, 10		1, 2, 6, 7, 9		1		
Halosaccion ramentaceum		1, 2, 8			1, 7, 9, 10	1, 2, 3, 4, 6, 9, 10		1, 5, 6, 9		1, 2		
Hildenbrandia prototypus					1, 2, 7, 8	1, 3		1, 2, 4				
Kylinia secundata					1, 9, 10	10						
Lithophyllum corallinae		1				2				1		
Lithothamnion glaciale		1			1			1, 2, 4				
Membranoptera alata					9, 10	3						
Petrocelis middendorfii					1, 7	1, 2, 9, 10		1, 2				
Peyssonelia rosenvingii										1		
Phycodrys rubens		1, 2			1, 9	3, 10		4		1		
Plumaria elegans		2, 8			10	3		2				
Polyides rotundus					1	3						
Polysiphonia arctica						10						
Polysiphonia flexicaulis					7			7				
Polysiphonia lanosa		1, 2, 8	7		1, 7, 9, 10	1, 2, 3, 9, 10		1, 2, 4, 5, 6, 9		1		
Polysiphonia urceolata		2			1, 7, 9, 10	1, 2, 3, 5, 7, 10		1, 2, 5, 9				

Table III (cont.)	J	F	M	A	M	J	J	A	S	O	N	D
Porphyra leucosticta					9			1, 2, 5, 6, 7, 9				
Porphyra miniata					1, 7, 9, 10	2, 3, 5, 6, 7, 10		1, 2, 4, 5, 6				
Porphyra umbilicalis		1, 2, 8			1, 7 9, 10	1, 2, 3, 6, 10		4, 6, 9		1		
Porphyra umbilicalis f. epiphytica					1	1, 9, 10		1, 2		1		
Ptilota serrata		1, 2			1, 9, 10	1, 3, 5, 9		4		1		
Rhodochorton purpureum	2, 8				1, 10	1, 2, 9, 10		1, 2, 7		1		
Rhodomela confervoides	2				7	1, 2, 3, 5, 7		1, 2, 6				
Rhodophysema georgii								6				
Rhodymenia palmata	1, 2, 8	7			1, 9	1, 2, 3, 6, 7, 9, 10		1, 2, 4, 5, 6, 9		1		
Spermothamnion repens						3						

Table IV. Distribution and Seasonal Occurrence of Phaeophyceae and Xanthophyceae

PHAEOPHYCEAE	J	F	M	A	M	J	J	A	S	O	N	D
Agarum cribrosum		1, 2			1, 9	1, 2, 3, 6, 9, 10		1, 2, 4, 6, 9		1		
Alaria esculenta		1, 2			1, 9	1, 2, 3, 6, 9, 10		1, 2, 4, 6, 9		1		
Ascophyllum nodosum		1, 2,	7		1,9	6, 10		1, 2, 4-7, 9		1		
Chorda filum					1, 7, 9	7		4, 7				
Chorda tomentosa					7, 9, 10	1, 3, 5-7, 9, 10		9				
Chordaria flagelliformis	1, 2		7		1, 7	1-3, 5-7, 9		1, 2, 4, 5, 7, 9		1		
Cladosiphon zosterae								2				
Desmarestia aculeata	1, 2				1, 7	2, 5, 10		1, 2, 5, 9		1		
Desmarestia viridis					1	2, 3, 6, 10		1				
Dictyosiphon foeniculaceus					1, 7	1-7, 9		1-2, 4-7, 9				
Dictyosiphon macounii								5				
Ectocarpus confervoides					10	6		1, 4				
Ectocarpus fasciculatus					1, 7							
Ectocarpus siliculosus								1				
Elachista fucicola						1, 3, 4, 9		1, 2, 4, 5, 7				

Table IV (cont.)	J	F	M	A	M	J	J	A	S	O	N	D
Fucus distichus ssp. *distichus*		1, 2			1, 9	1, 3, 9, 10		1		1		
Fucus distichus ssp. *edentatus*		1, 2	7		1, 10	1, 2, 3, 6		1				
Fucus distichus ssp. *evanescens*					1, 7, 9	3		2, 4-7, 9				
Fucus spiralis		2, 8			1, 9	1, 3, 4, 10		1, 2, 9		1		
Fucus vesiculosus		1, 2, 8	7		1, 9	10		1, 2, 4, 9		1		
Fucus vesiculosus var. *spiralis*			7		7	6		6, 7 2				
Isthnoplea sphaerophora								1		1		
Laminaria digitata	1, 2				1, 7, 9	1, 2 10						
Laminaria longicruris			7		1, 7, 9	7		6, 7				
Laminaria saccharina — ecotype		1, 2, 8	7		1, 9	1-3, 6, 7, 9, 10		1, 2, 4, 5, 6 2		1		
Leathesia difformis						2, 7		4,5				
Myrionema strangulans										1		
Petalonia fascia		8			1, 7, 9	1, 2, 5, 7, 10		1, 2, 4, 6				
Punctaria latifolia						5		5				
Pilaiella littoralis		1			1, 7, 9, 10	2-7, 9, 10		1, 2, 4-7, 9		1		

Table IV (cont.)	J	F	M	A	M	J	J	A	S	O	N	D
Ralfsia borneti		1			1							
Ralfsia clavata		1						4, 5				
Ralfsia fungiformis		1, 2			1, 9	10 1, 9, 10		1		1		
Ralfsia pusilla										1		
Ralfsia verrucosa					1							
Saccorhiza dermatodea						4, 5		1, 2, 6				
Scytosiphon lomentaria	8	7			1, 7, 9	1-7, 9, 10		1, 2, 4-6, 9		1		
Sphacelaria cirrosa	2				10	1, 10		2, 9				
Spongonema tomentosus					1			1				
XANTHOPHYCEAE												
Vaucheria sp.								4				